

Process and machine for merging ordered batches of objects, in particular batches of mail items

The invention pertains to a process for merging in particular batches of mail items such as letters, each previously ordered according to the order of distribution of the mail items in the mailman's round, so as to constitute a single batch of mail items which is also ordered according to the order of distribution of the mail items in the mailman's round.

In mail distribution offices, it is usual practice to merge or bundle together batches of mail items which originate from various sorting offices so as to constitute a single batch of mail items which is prepared for the mailman's round. Hitherto, the merging of these batches of mail items has been carried out manually and therefore requires a great deal of time. < - >

The purpose of the invention is to propose a process for automatically merging several batches of mail items with *short transit time loops associated to the destacking units.*

To this end, the subject of the invention is a process for merging in particular batches of mail items ~~each previously ordered according to the order of distribution of the mail items in the mailman's round, so as to constitute a single batch of mail items which is also ordered according to the order of distribution of the mail items in the mailman's round, consisting in~~

a) loading said batches of mail items to be merged respectively into corresponding destacking units each able to deliver in series the mail items of a corresponding batch,

b) destacking a certain number of mail items from each destacking unit and causing each destacked mail item to travel past a device for reading the postal address of the mail item before transferring it to a dynamic-storage magazine which is associated with said destacking unit and in which the mail items are moved in series around a storage loop;

c) analyzing in a control/command unit of the destacking units and of the dynamic-storage magazines, the postal addresses of the mail items pending in the dynamic-storage magazines so as to control the transferring of these mail items to a conveyor to which the dynamic storage magazines are linked in parallel, according to a certain sequence in such a way that the mail items exit the conveyor in series ~~according to their order of distribution in the mailman's round,~~

< EP- 834354 discloses a process according to the preamble of claim 1 wherein the destacking-units, disposed in succession along the conveyor path, deliver the objects directly to the conveyor in a time sequence determined by their transport along the conveyor path. US-4244672 discloses a process for merging batches of objects wherein the destacking units deliver the objects to the conveyor through a recirculation buffer. >

~~d) repeating steps b) and c) until the destacking units are completely empty~~ as defined in claim 1.

With the process according to the invention, several batches of mail items can be automatically merged in a single pass. The postal address recovered by the reading device can be a bar code which is now widely used in postal sorting offices.

~~According to a particular mode of implementation of the process according to the invention, in step b) indicated above, said mail items are transferred from a destacking unit to at least two dynamic-storage magazines each having a storage loop, these two dynamic-storage magazines being linked in parallel to said destacking unit and to the conveyor.~~ It has been observed that it is preferable to use several storage loops of low storage capacity associated with a destacking unit rather than a single storage loop of larger storage capacity so as to transfer the mail items more speedily to the conveyor. The number of storage loops associated with a destacking unit and the storage capacity of each loop is a compromise between the speed of merging of the batches of mail items and the interclassification window required between batches of mail items.

An exemplary implementation of the process according to the invention is described hereinafter in detail and illustrated in the drawings.

Figure 1 shows very diagrammatically a machine for merging batches of mail items according to the process of the invention.

Figure 2 is a flowchart illustrating the manner of operation of the machine shown in Figure 1.

In Figure 1, the machine for merging batches of mail items according to the process of the invention comprises several destacking units, here two destacking units D1 and D2, each able to serialize mail items of a batch of mail items which is preordered for the mailman's round, here the batches L1 and L2 which are loaded respectively into the destacking units D1 and D2.

The exit of each destacking unit is linked to one or more dynamic-storage magazines which is or which are associated with the relevant destacking unit. In each dynamic-storage magazine, the mail items indicated by A are moved continuously in series around a storage loop.

In the example of Figure 1, the exit of the destacking unit D1 is linked to two storage loops M11 and M12 by way of a series conveyor C1, the entrances E of the two storage loops M11 and M12 being linked in parallel to the conveyor C1.

The destacking unit D2 is linked to two other storage loops M21 and M22 by way of another series conveyor C2. The entrances E of the two storage loops M21 and M22 are linked in parallel to the conveyor C2.

Each storage loop M11 to M22 comprises an entrance E and an exit S disposed at two points of the loop and is able to store a certain number of mail items, in the present case three mail items. Each storage magazine M11 to M22 comprises a routing flap (not represented) disposed at the entrance point E of the storage loop and a routing flap (not represented) disposed at the exit point S of the storage loop allowing the introduction or the extraction of a mail item in the storage loop.

A first reading device DL1 is disposed along the conveyor C1 between the exit of the destacking unit D1 and the entrance E of the storage loop M11 furthest upstream on the conveyor C1 so as to read the postal address of each mail item extracted from the destacking unit D1 which will be transferred to the storage loops M11 or M12.

A second reading device DL2 is disposed along the conveyor C2 between the exit of the destacking unit D2 and the entrance E of the storage loop M21 furthest upstream on the conveyor C2 so as to read the postal address of each mail item extracted from the destacking unit D2 which will be transferred to the storage loops M21 or M22.

The reading devices DL1 and DL2 can be devices for reading matrix codes, for example bar codes.

The exits S of the storage loops M11 to M22 are linked in parallel to an exit conveyor CS in which the mail items are conveyed in series.

The conveyors C1, C2 and CS can be belt-type conveyors known per se. The dynamic-storage magazines M11 to M22 can also be embodied in the form of belt-type conveyors.

A control/command unit U synchronizes the transferring of the mail items from the destacking units D1 and D2 to the dynamic-storage magazines M11 to M22, recovers the postal addresses read (or the bar codes) by the reading devices DL1 and DL2 and synchronizes the transferring of the mail items from the dynamic-storage magazines M11 to M22 to the exit conveyor CS so that the mail items A exit the conveyor CS according to their order of distribution in the mailman's round.

Each link between the exit S of a storage loop and the exit conveyor CS can include a delay line R mounted in parallel with the link and which serves to compensate for the differences in path length of the mail items between the exits S of the storage loops M11 to M22 and the exit of the conveyor CS so as to maintain a constant spacing between the mail items moved in series in the conveyor CS.

Moreover, another dynamic-storage magazine M3 having a storage loop which is mounted in parallel with the conveyor CS downstream of the point of

confluence with the dynamic-storage magazine M22 in such a way as to make it possible to recover certain defects of classification of the mail items in the batches L1 and L2 to be merged. It is of course understood that the delay lines R and the dynamic-storage magazine M3 are under the control of the control/command unit U.

The exit of the conveyor CS can feed the entrance to a device for stacking mail items so as to produce a stack of mail items which is ready for the mailman's round.

Figure 2 illustrates the manner of operation of the machine shown in Figure 1.

The batch L1 of mail items is therefore loaded into the destacking unit D1 and the batch L2 of mail items is loaded into the destacking unit D2. These two batches have previously been ordered according to the order of distribution of the mail items in the mailman's round.

If $N1/2$ corresponds to the storage capacity in terms of number of mail items of a storage loop such as M11 (in the case of the example in Figure 1, $N1/2$ is equal to 3), the control/command unit U acts on the units D1 and D2 so as to serialize on exit from D1, $N1$ mail items, this being symbolized by the block 10, and on exit from D2, $N1$ mail items, this being symbolized by the block 20.

The postal addresses (or corresponding bar codes) of the $N1$ mail items serialized on exit from D1 and traveling past the reading device DL1 are recovered by the control/command unit U, this being symbolized by the block 11.

The postal addresses (or corresponding bar codes) of the $N1$ mail items serialized on exit from D2 and traveling past the reading device DL2 are also recovered by the control/command unit U, this being symbolized by the block 21.

In tandem with their destacking from D1, $N1/2$ first mail items A are initially transferred into the storage loop M11, this being represented by the block 12 and the following $N1/2$ mail items A destacked from D1 are transferred into the storage loop M12, this being symbolized by the block 13.

At the same time, in tandem with their destacking from D2, $N1/2$ first mail items A are initially transferred into the storage loop M21, this being represented by the block 22 and the following $N1/2$ mail items A destacked from D2 are transferred into the storage loop M22, this being symbolized by the block 23.

The control/command unit U keeps in memory a logical representation of the mailman's round in respect of the mail items A loaded into D1 and D2, analyzes the postal addresses recovered by the reading devices DL1 and DL2 so as to reorder them according to the mailman's round held in logic form in memory, this being symbolized by the block 30, and command accordingly, on the basis of

these exit postal addresses in conjunction with the location of the mail items in the storage loops, the extraction according to the appropriate sequence of the mail items from the loops M11 to M22 and their transfer to the conveyor CS so that these mail items exit the conveyor CS according to their order of distribution in the mailman's round.

Since the batches L1 and L2 are already preordered, the storage loop M11 is normally emptied before the storage loop M12 and the storage loop M21 is normally emptied before the storage loop M22, so that the storage loops M11 and M12 or M21 and M22 can operate alternately.

Thus, when the storage loop M11 is completely emptied, this being symbolized by the block 31, the control/command unit U acts on the unit D1 so as to serialize on exit from D1, N1/2 mail items, this being symbolized by the block 14, which are transferred into the storage loop M11, this being symbolized by the block 16, after being made to travel past DL1 for the reading of the postal addresses, this being symbolized by the block 15. Likewise, when the storage loop M21 is completely emptied, the control/command unit U acts on the unit D2 so as to serialize on exit from D2, N1/2 mail items, this being symbolized by the block 24, which are transferred into the storage loop M21, this being symbolized by the block 26, after being made to travel past DL2 for the reading of the postal addresses, this being symbolized by the block 25.

The block 32 symbolizes the analysis in the control/command unit U of the new postal addresses recovered by DL1 and DL2 for the corresponding transferring in sequence of the mail items to the conveyor CS.

Now, when the storage loop M12 is completely emptied, this being symbolized by the block 33, the control/command unit U acts on the unit D1 so as to serialize on exit from D1, N1/2 mail items, this being symbolized by the block 17, which are transferred into the storage loop M11, this being symbolized by the block 19, after being made to travel past DL1 for the reading of the postal addresses, this being symbolized by the block 18. Likewise, when the dynamic storage loop M22 is completely emptied, the control/command unit U acts on the unit D2 so as to serialize on exit from D2, N1/2 mail items, this being symbolized by the block 24, which are transferred into the storage loop M21, this being symbolized by the block 26, after being made to travel past DL2 for the reading of the postal addresses, this being symbolized by the block 25. The block 34 symbolizes the analysis in the control/command unit U of the postal addresses recovered by DL1 and DL2 for the corresponding transferring in sequence of the mail items to the conveyor CS.

The procedure loops back around the block 31 until D1 and D2 are completely emptied.

With the procedure indicated above, the interclassification window of the two batches of mail items corresponds to the storage capacity of two storage loops (6 mail items in the exemplary case of Figure 1).

Certain defects of classification in the batches of mail items L1 or L2 may be recovered by the control/command unit U by using the storage loop M3 whose capacity may be greater than that of one of the storage loops M11 to M22, the storage capacity of the loop M3 corresponding to the shifting of a mail item which it is possible to recover.

The process according to the invention can ideally be applied in respect of the merging of previously ordered batches of objects other than batches of mail items, for example, baggage items or the like, provided that each object bears a cue allowing its classification according to a certain sequence.